THE INSECT MAN: J.H. FABRE'S GOOD INFLUENCE

MARTIN HENDERSON
13 Kimble Road, London SW19.

The French entomologist J.H. Fabre will be known by reputation to most of the members of the Society. His work is available in the English translations of Alexander Teixeira de Mattos, and in compilations by several other hands. They are based on the 'Souvenirs entomologiques', which began to appear in 1879 when Fabre was fifty-three years old.

THE SETTING

Ecology as a science was hardly born in the late nineteenth century, let alone ethology. Many popular writers produced second-hand accounts of natural history. They stressed the natural theology of Paley: the study of nature was the study of God's work and everything in nature testified to the glory of God.

By contrast, in his entomological work Fabre gave unstinting attention to accurate observation of the living animal. In broad terms he was interested in instinct, which he believed to be relatively fixed in insects but capable of a certain flexibility sometimes which he called discernment.

FABRE AND THE THEORY OF EVOLUTION

In 1859 Darwin's 'Origin of Species' was published. It caused tremendous controversy, and it immediately gave studies in taxonomy more general interest and depth. Fabre, like several other eminent naturalists and scientists of his generation, never accepted the theory of evolution. He was well removed in his thinking from this idea: probably he was too set in his ways.

But he made a unique contribution in the minuteness and detail of his observations, his simple, telling experiments, and not least in his fluent literary style. His work is popular, and gives readers an understanding of the complexity of the insect lives he chronicled.

THE LIFE OF J.H. FABRE

There are some fascinating chapters of autobiography, and the life of Fabre is given in its essentials by W.K. Ford and E.W. Teale (see bibliography). There are also full-length biographies available in English, though I don't find any of them completely satisfactory.

Fabre's parents and grandparents were of farming stock, barely literate. His father moved to the market town of Saint Léons in the province of Aveyron and became a café proprietor. Jean Henri's school-days suffered a reversal due to his father not prospering, but he was a hard worker and able, and at 19 became a primary teacher at Carpentras, 20 miles to the north-east of Avignon. Here he took up the study of mathematics, obtained a degree and later worked in physics and chemistry. He moved to Corsica to teach these subjects: there was no scope for teaching natural history. But here he met the naturalist Moquin-Tandon, who influenced him in deciding that natural history would in future be his main interest. His observations of insects began at this time.

In 1853 Fabre returned to teach in the lycée at Avignon. In the succeeding years he married, there were to be five children of this marriage, and three by a second after the death of his first wife.

Fabre suffered two major disappointments in these years of teaching. To obtain money (which he would certainly need for a university post, his ambition at this time), he took up the study of industrial chemistry. Using facilities available at his school, he eventually succeeded in extracting the colouring-matter alizarin from madder-root. However he discovered that two German chemists had obtained the dye synthetically much cheaper, and the industrial process he had founded was still-born, though it became operative in a few factories.

Then in 1870, he participated in the teaching of secular subjects to girls. This was then considered the province of the Church: he was denounced from the pulpit, and given notice to quit his job.

However Fabre began to write a series of school-books and popular works in science. These became very successful (they have been translated into English). This enabled Fabre, in 1878, to buy a house in the outskirts of Serignan. Here he could continue his entomological work much more intensively, and it was here, using a wild garden which he called the 'Harmas' for his studies, that he finally wrote the classics of insect behaviour. My impression from my reading is of a solitary man, more immersed in the world of insects than of people, leading a very simple material life and completely dedicated to the largely unknown field of behavioural entomology.

Fabre and the hunting wasps

In 1854 Fabre read an article which, he tells us, decided him on concentrating on entomology. It was written by Léon Dufour, an army surgeon who on retiring, worked in entomology. Dufour worked on the sphecid *Cerceris*, which like all these 'hunting wasps' makes a cell (in holes in the ground or in woodwork or masonry) and stocks it with insect food for its larvae.

The *Cerceris* species Dufour studied hunts beetles of the family Buprestidae. Dufour found that the beetles were still fresh after having been stored for some time by the wasp as food for its larvae. From this he concluded that the wasp must inject some sort of preserving agent when it stings the beetle.

Fabre was not satisfied with this explanation, and carefully studied *Cerceris* and many other hunting wasps. He found that a related species, *Cerceris major*, stung its weevil prey once, in the ventral surface of the thorax. By referring to a contemporary work on insect anatomy, he concluded that this was the position where, in these weevils, the three thoracic nerve centres are to be found very close together. By this means the wasp paralysed the weevil. By stabbing a weevil with a thin nib dipped in ammonia Fabre himself could induce paralysis.

Fabre turned his attention to *Sphex flavipennis*, a hunter of crickets. *Sphex* stung its prey three times, in the neck, between the pro- and meta-thorax, and at the base of the abdomen. This, he concluded, coincided with the position of the three nerve centres in the cricket.

The idea that the wasp stings the nerve centres is an inference rather than an established fact. Later workers have emphasized that it can be very difficult to see clearly how a wasp attacks its prey. I think the idea of the hunting wasp as 'clairvoyant surgeon' is somewhat exaggerated. But this is said to be the work in which Fabre took greatest pride.

Fabre and the dung beetles

Fabre was the first to study the behaviour of European dung beetles systematically and thereby reveal their diversity and interest. He appreciated, for example, that the

behaviour of *Copris lunaris* and others could be seen as a simplified version of the complex brood care and nest defence found in social insects.

Nowadays dung beetles (Aphodiinae, Geotrupinae and Scarabaeinae) are broadly classified as rummagers, buriers or rollers. Rummagers (typically Aphodiinae) lay their eggs in dung on the soil surface and so show the minimum parental behaviour of ovipositing on the food source. Buriers (typically Geotrupinae, but also many Scarabaeinae) excavate burrows and fill them with rounded or sausage-shaped dung masses in each of which an egg is laid. Parental care is limited to the provision of food for the larvae in a sheltered position, and defending the nest whilst it is being constructed. Of this group, Fabre worked on *Geotrupes*, *Onthophagus* and *Onitocellus*.

Beetles of the tribe Coprini (Scarabaeinae) convert buried dung into freestanding brood balls in each of which an egg is laid. Fabre observed that the female *Copris lunaris* stays in the underground chamber and protects the brood balls from kleptoparasites and predators. And that in the first stages of nest building she gets assistance from the male beetle.

The tribe Scarabaenini are rollers: a ball of dung is rolled away some distance before being buried in a chamber where it is either eaten or converted to a brood ball. Of this group, Fabre worked on the so-called 'sacred scarab' (he doesn't give its latin name). His studies of this species extended over forty years: his initial observations at Avignon failed to reveal the nesting habits of the beetle. For this he 'required prolonged residence in the country, the proximity of herds and flocks in the bright sunshine'. When he moved to Serignan he was able to study first this species then many others.

This is the beetle which fascinated the ancient Egyptians, who carved its image in the crypts of their dead. The beetle moulds dung into a sphere, and rolling it backwards, takes it to a suitable place for digging a burrow. Here it stays until its provisions are consumed.

During the nesting period, in the hot days of May or June, it is more careful in sorting the dung, and when it has taken a ball of it underground, moulds it into a pear shape. In the elongated neck of the 'pear' the egg is laid in a porous chamber.

Paradoxically, for all his scorn of evolutionists and their explanations, the diversity of habits Fabre documents testify strongly to the adaptive influence of the environment in moulding behaviour. In a recent paper Klemperer considers some of the homologies, preadaptations and intermediary behaviour shown by the dung beetles.

Fabre briefly gives the rationale for his mode of approach to entomology: 'Nomenclator's entomology is making enormous strides: it overwhelms us, swamps us. The other, biologist's entomology, the only interesting branch of the science, the only one really worthy of our attention, is neglected to such an extent that the commonest species has no history, or calls for serious revision of the little that is known.' His studies led Fabre to insist on the taxonomic value of behaviour.

Fabre — the verdict of posterity

It has been suggested that Fabre, influenced by his studies of mathematics, physics and chemistry, was interested in establishing clear-cut laws when he came to study insects. Thus he failed to give as much importance to exceptions to the rule as modern research workers have found they have to.

Without defining instinct, he attempted to point out its characteristics. He viewed it as a sequence of invariable acts inevitably linked together in a necessary order. The

question is a profound intellectual, almost philosophical one, and he was surer than present day scientists of the machine-like character of instinct. Even he, however, allowed some discrimination in privileged species (e.g. *Copris*).

He was isolated, narrow in his knowledge of entomological literature, frequently repeating experients that had been reported by others without apparently knowing they had been done before. Sometimes Fabre's facts have been found to reveal only a segment of the full picture. Occasionally it is not possible to tell from his description of an insect which of several species he was describing.

But Fabre was a pioneer, working in poverty with crude equipment. The discrepancies others found in his writing led to much fruitful work. Darwin's appelation of Fabre as 'incomparable observer' hits the nail on the head.

Bibliography

Fabre, J.H. 1913. *The Life of the Fly, With Which are Interspersed some Chapters of Autobiography*, trans. de Mattos, Hodder and Stoughton, London.

Fabre, J.H. 1919. *The Sacred Beetle and Others*, trans. de Mattos, Hodder and Stoughton, London.

Fabre, J.H. 1916. *The Hunting Wasps*, trans. de Mattos, Hodder and Stoughton, London.

Ford, W.K. 1959. Some thoughts on Jean Henri Fabre. *Entomologist's Gazette*, **10**: 19–26.

Klemperer, H.G. 1983. The evolution of parental behaviour in Scarabaeinae (Coleoptera, Scarabaeidae): an experimental approach. *Ecol. Ent.*, **8**: 49–59.

Teale, E.W. 1949. *The Insect World of Jean Henri Fabre*, Dodd, Mead & Co., New York.

BOOK REVIEW

Bumblebees. Oliver Prys-Jones and Sarah Corbet. Cambridge: Cambridge University Press, 1987, 96 pages, £5.95 (paperback), £15 (hardback).

The Cambridge Naturalists Handbook series is aimed at students and professional entomologists as well as amateur naturalists. This sixth volume is, like the others, intended to provide an essential basis for field work and indeed fulfils this task well.

There are excellent sections on the natural history and biology of bumblebees, together with the necessary keys and text illustrations for identifying all the British species. Identification of the commoner species is further helped by four colour plates.

In common with the other volumes in the series, this one contains many interesting ideas for future research into different aspects of bumblebee biology. Unfortunately, many of the experiments and techniques detailed would be better suited to those entomologists with access to laboratory facilities than to the average amateur hymenopterist operating from home.

However, there is a wealth of information packed into the 96 pages, and anyone who is at all interested in these attractive and familiar insects will benefit from reading this book. The cost of the hard cover version may be prohibitive to some, but the paperback edition is more reasonable.

I. Hudson